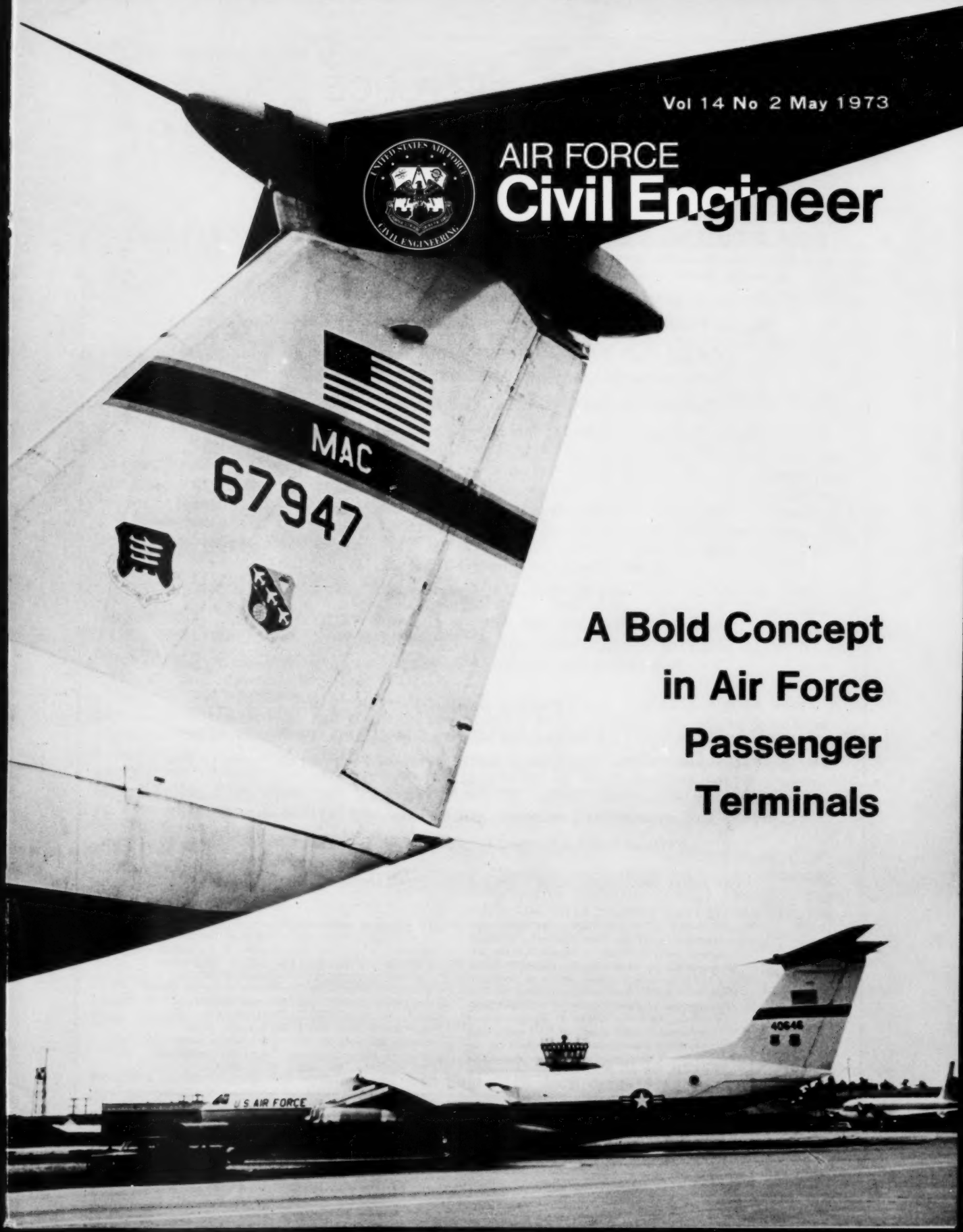
Vol 14 No 2 May 1973

AIR FORCE Civil Engineer



A Bold Concept in Air Force Passenger Terminals

AIR FORCE Civil Engineer

USAF RECURRING PUBLICATION CE 85-1 **VOL 14 NO 2 MAY 1973**

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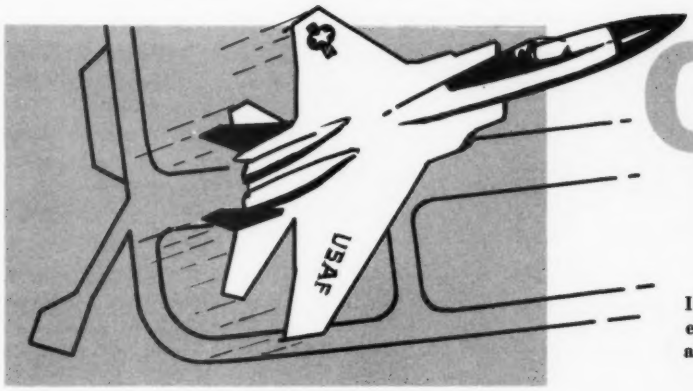
Front Cover Photograph: S/Sgt Urias and Sgt Boyer, Det 3, 601 Photo Sq, AAVS.

The **AIR FORCE CIVIL ENGINEER** is an official nondirective Headquarters US Air Force publication published quarterly under provisions of Chapter 2, **AFM 5-1.** Its purpose is to provide Air Force Civil Engineers with a timely and comprehensive picture of the importance, wide ranging involvement and direct relationship of civil engineering activities to successful accomplishment of the Air Force mission. It provides current information about significant civil engineering programs and accomplishments throughout the Air Force; pertinent developments in science engineering and management; and educational/training opportunities for enhancing professional thought and development. The Journal is edited and published by the Civil Engineering School, Air Force Institute of Technology. Contributions, suggestions and criticism are welcome. Opinions expressed do not necessarily reflect the official viewpoint of the Department of the Air Force, the Director of Civil Engineering or the editorial staff. DISTRIBUTION: F. The Journal's annual subscription prices are: $2.00 domestic; $2.50 foreign; 45 cents per copy. Mail check or money order to Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.

Address Correspondence to: Editor, Air Force Civil Engineer, AFIT-DE, Wright-Patterson AFB, Ohio 45433



Current Emphasis

Information published here is designed to keep civil engineering personnel aware of late developments and significant trends within the career field.

LATEST ON PROGRAMMING MANUALS--All but a few chapters to AFM 86-1 are being updated and returned to the printers. An initial increment of about five chapters should be available to the field this summer, with a second increment of 10 chapters to follow. AFM 86-2, which replaces AFM 86-4, is undergoing initial distribution at this time.

POLLUTION ABATEMENT PROGRAM--FY 75 will be a critical funding year for air pollution projects to meet federal, state and local regulations implementing the Clean Air Act. Compliance schedules for presently non-complying sources must be negotiated with state and local agencies before project submittal. Planning for implementation of the new Federal Water Pollution Control Act Amendments should begin immediately to include FY 75 MCP programming where appropriate.

RESIDUAL MATERIAL HOLDING ACCOUNT--Cost Account Code 51200 has been authorized to collect costs of work order material residue. Transfer of material to this account is permitted if there is a need for the item(s) and when turn-in to base supply would result in no-credit from the stock fund. Residual material may be retained in this account for six months.

THE ENERGY CRISIS--Heating fuels (natural gas and oil) are in short supply. The situation is not expected to improve next winter. To avoid problems encountered last winter, installations should insure that oil tanks are full by 1 September 1973, and sufficient oil is under contract (prime and standby) to carry them through the winter. At the beginning of next heating season, plants with standby fuel will fire each boiler at least six hours with the standby fuel to insure readiness and reliability of the standby fuel system and controls.

GOLF COURSE MAINTENANCE EQUIPMENT--Maintenance of sand traps on golf courses by hand is a laborious task which consumes many manhours. Labor saving equipment (sand trap rake, tractor attachment, FSN 3750-155-2649L) for this purpose was proven to be highly efficient under the Maintenance Evaluation Program. The rake is included in the latest revision to TA 008.

FIRE PROTECTION FOR LARGE WAREHOUSES--A study of fire protection systems within large Air Force warehouses, under the auspices of the Air Force Weapons Laboratory, is now being conducted. A large orifice sprinkler has been developed that provides vastly improved protection.

POLLUTION CONTROL--The water-spray system developed by the Air Force Weapons Laboratory for control of air pollution from fire-fighting training will not be available for detailed FY 75 MCP programming. If majcoms can justify urgent situations threatening the fire-fighting training at one or more bases, HQ USAF will consider a lump sum appropriation request in FY 75.

FREEZE CONTINUES--The freeze on advertisement of projects costing in excess of $50,000 continues in effect indefinitely. Commands indicate that response to request for clearance has been timely.

F-6/F-7 RUNWAY FOAMER REQUIREMENTS--Action has been taken to establish a reserve pool of excess serviceable F-6/F-7 refueling trailers. About 30 each of the best reported F-6/F-7 assets will be retained to fill future command requirements pending production of the A/S32P-14 resupply/foamer.

ENVIRONMENTAL ASSESSMENTS--Each FY 75 MCP project submitted by major commands to HQ US Air Force must have a written assessment maintained at the command headquarters from the time it is submitted. If a candidate environment statement is required, it must follow the project (DD 1391c) submittal within 30 days.

OFFICER EXCHANGE PROGRAM--The Army, Navy and Air Force have agreed to initiate a civil engineering officer exchange program designed to provide specialized career broadening experience in engineering and construction. Each service will place four officers, grades 03 and 04, into the program. Selectees will serve two year tours in positions at locations in the CONUS or overseas.

BEAMS STEERING COMMITTEE--A committee was organized late last year as an all major command represented body "to make BEAMS a more effective management system." Find out who your representative is and make your base views known.

NEW COURSE ANNOUNCEMENT--The USAF School of Applied Aerospace Sciences at Chanute AFB announces a new two week course entitled Firefighting Vehicle Operator. It is designed to train Air Force personnel in the skills and knowledge necessary to perform fire protection inspection and operation duties on the A/S32P-4 vehicle.

UTILITIES CONSERVATION MOVIE AVAILABLE--FR 1266, Utilities Conservation Management, a new 19 minute color film, outlines the objectives of the Air Force Utilities Management and Conservation Program. It also gives the various responsibilities and procedures for developing and implementing a base program. It is available for Air Force film libraries.

RUNWAY ROUGHNESS STUDY--The Air Force Weapons Lab is studying runway roughness. Automated profiling equipment is being used to collect the runway profile which in turn is being used as input to an aircraft simulation code to predict the dynamic response of the aircraft. Aircraft response will be used to define functional failure of the runway and identify specific areas of the runway causing the unacceptable level of aircraft response. A number of runways have been surveyed. The work is being coordinated with the FAA.

P-2 FIRE TRUCK CORROSION TREATMENT--TO 36A12-8-1-5, Corrosion Treatment of Water Storage Tanks and Piping on Fire Protection Equipment, describes improved protective coating precedures. To determine the most effective long-range solution, a P-2 has been modified with zinc anodes and is being tested at Barksdale AFB.

APPLICATIONS ENGINEERING PROGRAM--AFR 93-8 is being revised to reflect the Civil Engineering Center's functional transfer to the Air Force Systems Command. BCEs are encouraged to submit projects on promising new products and material to the Center through their major command AE program monitors.

A truly advanced design in passenger terminals is the recently opened facility at Rhein Main AB, Germany. Among its customer features are the telescopic passenger loading/unloading bridges which link to any size aircraft.

Ever wondered what's the other "half" to the often heard comment "Half of the fun in getting there is flying"? To Military Airlift Command, the primary mover of thousands of personnel from one place to another worldwide, it is passenger comfort while processing through its terminals.

Convenience is a fitting word to describe the Departure Lounge where access is easy to a BX, cafeteria and nursery.

A Bold Concept in Air Force Passenger Terminals

The Military Airlift Command (MAC), in carrying out its airlift responsibilities, maintains a continuous close surveillance over its passenger terminal facilities and operations located throughout the world. MAC had recognized early in 1965 that its World War II vintage terminals could not cope with the emergency traffic loads imposed by the Southeast Asia (SEA) build-up. New terminals were designed and constructed for Yokota AB, Japan, Norton AFB, California, and McChord AFB, Washington, based on the commercial airline concept of separation for outbound and inbound passenger processing. However, Travis AFB, California, which is the major port of embarkation for the South Pacific, received only necessary alterations and renovation to meet SEA requirements. These crucial years of experience were the determining thought that, if given the time and funds, a truly advanced design could be developed to specifically meet MAC's requirements for any emergency. Rhein Main AB, Germany, offered this opportunity.

Located on the second floor, the snack bar features hot and cold food, ample seating and attractive surroundings.

In 1968, terminal data was compiled at Rhein Main AB that indicated passenger workload was causing daily delays in passenger processing. The primary reason was that terminal operations were carried out in three separate facilities scattered about the base. These facilities were substandard and not primarily designed for passenger terminal operations. The inbound terminal function operated at one end of the freight terminal, while the outbound operated as part of the Base Operations facility. The terminal offices and check-in operation were located at the Base Hotel.

All of these terminal operations necessitated busing and extra manning, and added to extending passenger processing time. The stretch DC-8, the 747 and the C-5 Galaxy, which were two to three years away at the time, would certainly add to the problem.

To further complicate the problem, Rhein Main is located on the opposite side of the field of the busiest air traffic city in Europe, Frankfurt, Germany, which is the hub of Europe's passenger/freight operations. All military and Department of Defense civilians stationed or traveling throughout Europe must channel through Rhein Main.

What was needed was a modern passenger terminal to handle all of the passenger functions and provide customer service and convenience. Representatives of MAC transportation and Civil Engineering made an on-base review of Rhein-Main operations and requirements and visited several European civilian terminals, which resulted in the development of a concept for a story-and-a-half facility. The approach was to provide second-level departure lounges, telescopic loading bridges and many other features that would provide Rhein Main with an ultra-modern passenger terminal in keeping with projected jet-age requirements.

BCE Develops Programming Documents

Programming documents were developed by the Base Civil Engineer for a 63,500 square foot facility which was later approved by Headquarters US Air Force for design and construction.

Headquarters US Air Forces in Europe (USAFE) issued the design instruction and the search was on for an architect-engineer (A-E) firm to develop the design and construction documents. Experience in the design of modern civilian terminals was the prime criteria, and on this basis the firm of McGaughy, Marshall and McMillan of Athens, Greece, was selected. The final product is a tribute to the professional fields they represent.

Concurrent with the A-E selection, Headquarters Air Force Logistics Command (AFLC) was advised by MAC of the requirement for the telescopic passenger loading bridges. AFLC has the responsibility to program, fund, design and procure mechanized baggage handling systems, including loading bridges. Although the telescopic passenger loading bridges were an AFLC first, the requirement was met with high excellence. Two telescopic passenger loading bridges, built in Ogden, Utah, were airlifted from Hill AFB, Utah, to Rhein Main on a MAC C-5 Galaxy.

In addition to the Rhein Main passenger terminal, MAC has completed or is in the process of providing improved passenger terminal facilities at other locations as follows:

A. NEW TERMINALS

Location	Size	Cost ($000)	Completion Date
Norton	66,500 SF	1,028	Jan 69
Conversion of existing structure. Cost included conversion of warehouses to Transient Passenger Quarters.			
McChord	32,000 SF	1,113	Dec 69
MAC's first modern passenger terminal.			
Yokota	43,500 SF		Jun 71
Completed in 3 phases.			
Hickam	32,000 SF	1,101	Jan 73
Two-story with Admin., DV and Dependents' Lounge on 2nd floor.			
Mildenhall	35,000 SF	878	Dec 73
Two-story terminal. Inbound/outbound passenger processing and customs on first level. Cafeteria, BX, arrival/departure lounges on second level.			

B. ADDITIONS/ALTERATIONS

Location	Size	Cost ($000)	Completion Date
Osan, Korea	3,133 SF	42	Nov 71
Admin area addition plus alteration of existing facility.			
Charleston	7,529 SF	263	Dec 71
Alteration of the interior and expansion of air conditioning system.			
Travis	25,000 SF	602	Jan 72
Departure lounges and custom/debriefing addition.			
McGuire	8,800 SF	256	Jun 72
Departure lounges.			
Incirlik	8,800 SF	489	Jul 72
Provides kitchen/snack bar, passenger offices, lounge, customs, baggage processing and small BX.			
Torrejon	15,596 SF	173	Mar 73
New baggage and passenger processing system.			
McGuire	19,900 SF	921	Aug 73
Outbound baggage, inbound briefing and clearance offices.			

The two bridges, similar to those found in most U.S. international/stateside airports, link each wing of the new terminal directly to any size aircraft, enabling passengers to be under cover at all times when proceeding to the plane from the terminal or vice-versa.

The completed terminal design incorporates numerous customer service features such as single-point passenger baggage check-in, second-level departure lounges and telescopic passenger loading/unloading bridges. Modern mechanized outbound/inbound baggage handling systems have been installed. Maintenance-free materials, such as terrazite topping, have been used for the floors, and colorful vinyl fabric wall finishes have been incorporated. The administrative core is located on the second level. The cafeteria, which is for passengers and terminal employees, will serve case line prepared foods and hot short order food items.

Several conveniences such as a desk, typewriter and reading material are found in Distinguished Visitors Lounge.

The terminal can load and unload two 747 aircraft simultaneously, one at each of the two wings of the story-and-a-half terminal. Hydrant fueling outlets are located to allow the aircraft to refuel while linked to the terminal.

Ample parking was provided with excellent access to or from the terminal and to other areas of the base. The terminal's centralized location eliminates the need for bussing passengers to the runway or to the Rhein Main Hotel to pick up luggage and check through customs.

A closed circuit television is being programmed which will provide passengers with current flight information and will also provide surveillance to prevent smuggling and pilfering within the terminal. In support of the MAC anti-hijacking program, the 435th Military Airlift Support Wing at Rhein Main is using portable glass partitions to designate "sterile" departure lounges in either wing. The concept of operations for the terminal permits both outbound and inbound passengers to completely check in or out on the first (ground) floor.

Pre-departure custom clearance, that is, search of hand baggage, is in accordance with federal anti-

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Bold Concept *cont'd*

hijacking/smuggling directives/laws. Passengers, when cleared, go directly to the second floor departure lounge area, which contains the cafeteria, DV and Dependents' Lounges.

Inbound passengers enter the second level arrival lounge from the telescopic passenger loading bridge and are briefed/cleared for immigration and health. Passengers then descend by escalator or stairs to the lower level where their baggage is awaiting on a modern baggage conveyor system. Customs inspection takes place in this lower area. A Sponsors Lounge is located outside Customs.

Customers with more than one piece of luggage will appreciate the convenience of the automatic doors.

Construction of the building began in June 1971 and the terminal first opened when General Jack J. Catton, then Commander of MAC, opened the facility during a ribbon cutting ceremony on 17 June 1972.

In essence, MAC has truly improved the Air Force image by providing its customers with a facility second to none on the commercial horizon.

"Assignment Europe" or just a short visit, business or otherwise, can now become an event to look forward to or remember. The approach will acquaint you with the magnificent proportional outline of the terminal. You step from the plane and pass through the carpeted telescopic passenger bridges to the terminal. You pause and say to yourself, "Can this be MAC?" The fresh and decoratively furnished arrival/departure lounges will give you a feeling that you are in the most luxurious international terminal in Europe. The soft music is interrupted with clearance instructions and you're on your way through Immigration and Health. You descend to the lower level, by escalator, where your baggage will be waiting on the modern baggage conveyor system. A few steps and you are through Customs and into the "Sponsors Lounge" where friends or sponsor will greet you.

Buses, limousines, and taxis are readily available as you pass through the automatic doors to the large covered sidewalk area.

Nostalgic Feelings on Departure

Departure for home can become a nostalgic feeling. Through the automatic doors across the beautiful terrazzite floors to the check-in counters where travel clearance and baggage check-in are routine. Up the escalator to the Departure Lounge where all the convenience for your relative short waiting period is there for your comfort—Dependents or DV Lounges, nursery, cafeteria and an attractive BX shop for last minute purchases. Then "bon voyage" as once again you pass through the telescopic passenger bridge to the waiting plane to take you to your destination. You will want to return and there is no doubt, you will remember the Rhein Main Passenger Terminal. CE

A customer feature of the new Rhein Main terminal is the single-point passenger baggage check-in counter area.

Have a need to know the latest on the airfield pavement capacity at your base? Or, do you need good airfield basic data for a contingency planning operation? Search no longer. Just . . .

Ask the Defense Mapping Agency

by Maj Darrell G. Bittle, PE, and Norman L. Levine

Have you ever reported into the civil engineering organization of an overseas base, and raised the question: "What is the airfield pavement capacity?" Was your question met with a blank stare? Or, how many times have you wrung your hands over the lack of good airfield basic data during a contingency planing operation in a headquarters? Possibly, your dilemma could have been solved easily if you had been packing a copy of the AAFIF, Automated Air Facilities Information File.

AAFIF is an automated basic data bank containing evaluated data on the operating areas and related support facilities and service at all known airfields and seaplane stations of the Foreign Free World. (Information is also included on selected airfields within the United States.) The responsibility for the operation of this data bank rests with the Defense Mapping Agency Aerospace Center (DMAAC), formerly a separate operating agency of the Air Force called the Aeronautical Chart and Information Center (ACIC). DMAAC is located at St. Louis AFS, Missouri.

Four References Made to ACIC

There are references to ACIC in four Air Force publications commonly used by Air Force Civil Engineers (AFCEs); however, most AFCEs are not fully aware of why DMAAC needs the information specified in these publications. This discussion will explain why this data is needed and will relate the potential return on your investment of time in providing the necessary information to DMAAC. The four publications involved and their topics are **AFR 86-4,** Base Master Planning; **AFR 55-42,** Aircraft Arresting Barriers; **AFM 28-3,** Contingency Planning; and **AFM 93-5,** Airfield Pavement Evaluation. **AFR 86-4** is the regulation that establishes responsibilities for producing and implementing an installation master plan. **AFM 86-9,** Statement of Work for Master Planning, specifies the contents.

The AAFIF contains specifics or a narrative text on the following data elements:

1. **General:** Lists the airfield geographic coordinates, source of coordinates, magnetic variation, elevation, grid coordinates, grid system, base reference point, graphic references, location and landmarks, terrain and drainage and controlling agency.

2. **Operations:** Activities at the airfield, occupants, operational capability, auxiliary airfields and future plans for expansion.

3. **Navigational Aids and Communications:** NAVAIDS and communications and appropriate comments regarding these facilities. Air traffic control capability, instrument and visual flight rule conditions.

4. **Airfield Description:** Physical make-up of airfield and appropriate comments regarding runways, taxiways, parking, lighting, etc., including pavement evaluation data.

Includes POL Storage Capacity

5. **Maintenance and Servicing:** Types, amount and storage for aircraft available on and off the airfield. Includes POL storage capacity, type, fuel stock levels and resupply data.

6. **Special Purpose Equipment:** Type and availability of crash, fire, wreckage, snow and cargo equipment.

7. **Base Services:** Services available for personnel needs and security. This shows water supply, sewage treatment, airfield security and electrical power source and capacity.

8. **Transportation:** Modes of transportation available in the vicinity of the airfield, including roads, railroads, waterways, air — availability of military and commercial vehicles.

9. **Weather:** Operator, type of weather station, the climate, flying conditions and general weather conditions, including records on precipitation, temperature and dew point.

10. **Significance:** Significant data concerning historical information, plans, potential and factors limiting utilization or expansion.

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Mapping *cont'd*

The AAFIF is produced from source material of the DoD Centralized Library of Air Facilities and Flight Information covering Foreign Free World areas. This official repository, also maintained by DMAAC, contains a comprehensive collection of reports, publications, engineering drawing and related materials. Contributions to this Library are made by the Defense Intelligence Agency (DIA), Unified and Specified Commands, US Army, Navy and Air Force. This composite collection of information also constitutes the source that is used for the production of a variety of aeronautical charts, Flight Information Publications and related products to satisfy the operational requirements of DoD flying operations.

Figure 1.

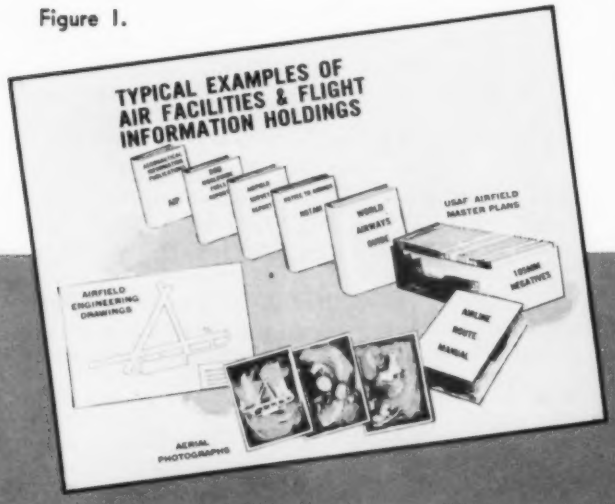

Figure 1 shows some of the many sources of data involved. In this regard, it is noted that the 105mm negatives of the Base Master Plans forwarded by each base, each year, as required by **AFR 86-4,** are highly considered and referred to as primary sources of airfield data. While **Figure 1** shows some of the more classical sources of the Library, there are numerous additional materials evaluated at DMAAC and input to the AAFIF. **Figure 2** indicates the worldwide nature of the source collection effort and equally important, the analysis and evaluation phase. At DMAAC, a team of aeronautical informational specialists headed by a desk chief for a given geographical area, studies the sources and evaluates those items which apply to the AAFIF. The data then is loaded into the computer at DMAAC, and periodic updates maintain the currency of the file. The distribution list of customers for the total AAFIF or portions of it, is 19 pages long and includes all major, unified and specified commands and numerous other DoD agencies.

The AAFIF is available in the form of magnetic tapes or machine printouts and is classified. Agencies which receive the AAFIF in magnetic tape form initially receive all or specified portions of the master file. They are, thereafter, automatically supplied cumulative magnetic tape updating on a weekly, monthly, quarterly or semi-annual cycle, whichever suits their requirements. Computer programming software assistance can be provided to those US Government agencies initially acquiring AAFIF tapes. This assistance will necessarily be limited to technical expertise consultation and furnishing copy of DMA AAFIF programming documentation.

How does the AFCE fit in this picture? Probably, his role has been a passive one in the past, sending only Master Plan updates and aircraft arresting barrier status reports to DMAAC as required by **AFR 55-42.** There is a much more active role for the AFCE. At base level, the first step would be to request a printout from DMAAC of the AAFIF for that particular base. A review of data in this printout may reflect specific gaps in information, unknown at DMAAC. Although the Master Plan data is applied to the AAFIF, such basics are the fabric of other detailed reports. And it is likely that these reports were not made available to DMAAC.

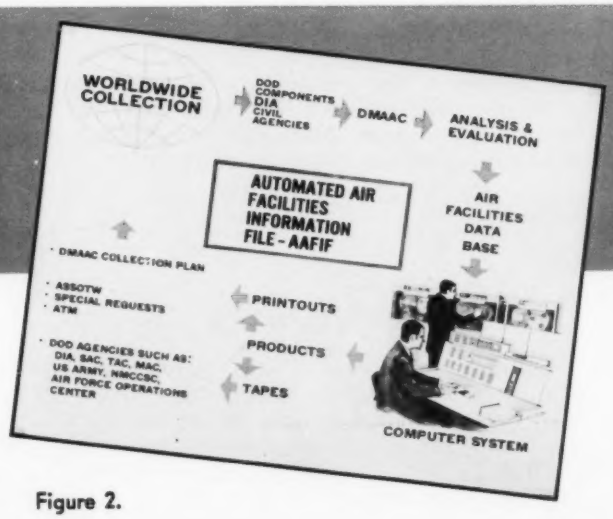

Figure 2.

Each base has available numerous engineering studies, reports, evaluations and the like which may contain data not specifically reflected in the Base Master Plan, but important, nevertheless. The variations are as numerous as the bases. Certainly, an important source document is the latest Airfield Pavement Evaluation together with any known airfield pavement analyses of non-Air Force-owned pavements which are part of the aerodrome. If some years have passed since the last analysis, repair or upgrade projects may have taken place which might materially affect the existing analysis.

Once the information is gathered by the AFCE, a close look at DIA **Manual 58-2** would be in order. Detailed instructions in this Manual explain how to prepare DD Form 193, which is the basic instrument for an AAFIF update. Chapter 11 of **AFM 28-3** provides excellent guidelines to follow. A probable source for this classified manual at base level is the Intelligence or Operations element.

In overseas theaters, many joint commands conduct Aerial Lines of Communications (ALOC) and auxiliary airfield studies, either with or without engineer assistance. Studies and evaluations conducted by the Army and Navy on their airfields might have provided the data in the AAFIF for certain bases but also might be able to provide some needed data on other bases for Air Force use. These studies and their conclusions are natural candidates as source for the AAFIF. The AFCE is in a unique position to ferret out these sources and make the data available to the AAFIF.

In addition to the classic contingency planning and base level airfield data bank facets of the AAFIF, some comments are in order on the possibilities of this automated data bank for advanced techniques of base site selection and AFCE contingency team determination. With the data in the same automated format for each base, use of computer programming techniques would allow the rapid nomination of sites meeting certain criteria as to geographical area, water source, runway length or weight bearing capacity, existing POL storage and limitations on expansion. With the advent of the Bare Base Program, base profiles by area, country or theater could be rapidly produced to meet aircraft range specifications from a specified combat or theater of operations area. Mathematical modeling techniques concerning the amount of airfield matting, emergency power units and distribution systems, perimeter security fencing and a host of other concerns, could yield precise data on the numbers of AFCE personnel and aircraft loads required to operate at any force level from any specified forward bases. The possible future use of the AAFIF in this area are both exciting and challenging.

It cannot be over emphasized that the data in the AAFIF is only as good as the source information received by DMAAC. Air Force Civil Engineering must recognize the tremendous possibilities of the AAFIF, both for its career area and others, and to also recognize the role AFCEs must play in assuring that the right data gets to the right people in a timely manner. It is an opportunity for civil engineering to show what it has to offer other career areas, and at the same time, how to improve its own management capability in the airfield facilities area.

The first step for the BCE is to request a data printout from AAFIF for his base or the tape for his command or geographical area. Each request will receive 48 hour service and can be in TWX or letter form addressed to: DMAAC/ADP, St. Louis Air Force Station, Missouri 63118. The BCE can also call AUTOVON 698-8373 to discuss his requirement for tailored printouts with a project officer who will service the request. CE

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Worth Noting

Going . . . Going . . . Gone! The Story about Faucet Valve Seats

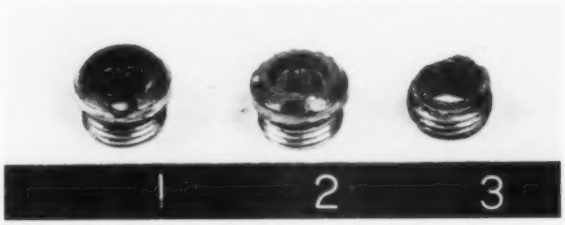

Figure 1: The Deterioration of a Valve-seat.

These words describe the cold-water faucet valve-seats shown in **Figure 1.** Once the deterioration process starts, it always ends in complete destruction. Intermittent dripping culminates in a continuous stream of leaking water. Hundreds of thousands of gallons of water go "down the drain" each year at many Air Force bases because of valve-seat failure. Poor utilities conservation and wasted operations dollars are the end result.

It is well known, but not widely appreciated, that plated-brass valve seats fail by a process called erosion-corrosion. It is sometimes referred to as "wire-drawing." One of the eight basic forms of corrosion, erosion-corrosion damage is caused by the relative movement between the corrosive water and the metal surface. Rapid relative movement or turbulent flow are required for erosion-corrosion to occur. Mechanical wear effects or abrasion (that is, because of unfiltered solids in the domestic water supply) can also be involved. Basically, erosion-corrosion results from the repetitive formation (corrosion) and destruction (mechanical erosion) of the corrosion-retarding surface film on the metal by the rapidly moving corrosive water.

Erosion-corrosion is characterized in appearance by deep grooves, gullies, waves and valleys. An absence of corrosion products and a "clean-metal" appearance in the area of attack are evidence that the destructive process was erosion-corrosion.

Metals and alloys differ in their resistance to erosion-corrosion damage in potable waters. Titanium, Hastalloy C, Type 316 stainless steel, and Monel are significantly more resistant to this deleterious phenomenon than brasses or bronzes.

It is well established that the most practical solution to this annoying and costly problem is to replace the failed plated-brass valve seats with seats made of Monel (see T. E. Larson, R. M. King, and L. Henley, **Journal of the American Water Works,** Volume 48, pages 84-88, 1956). These seats are generally available from specialty houses and some manufacturers of faucets having renewable seats. If Monel seats are not available for a given faucet model, seats made of an austenitic grade of stainless steel should be equally satisfactory in minimizing the erosion-corrosion problem.

12 Air Force Civil Engineers Selected for Promotion to Colonel

Twelve Air Force Civil Engineers have been nominated for promotion to the rank of Colonel. Ten were named from the primary zone and two from the secondary zone. Those selected in the primary zone are:

Lt Col John T Cunningham III, CCK, Taiwan: Lt Col Arthur J. Hartmann, Wright-Patterson AFB, Ohio; Lt Col Robert W. Iten, AF/PRE; Lt Col Sheldon J. Lustig, Vandenburg AFB, California; Lt Col James G. Macoubray II, Headquarters Military Airlift Command; Lt Col Roger W. Nielson, Air Force Civil Engineering Center, Tyndall AFB, Florida; Lt Col Weston A. Roe, Carswell AFB, New Mexico; Lt Col John P. Thomas, Headquarters Tactical Air Command; Lt Col Ernest H. Slaughter, Patrick AFB, Florida; and Lt Col David L. Waldron, AFEES, Barr, Germany.

Those nominated from the secondary zone are Lt Col Thayer W. Allison, ICAF, and Lt Col Harry E. Auld, Korat, Thailand.

Course Director Named Outstanding Junior Officer of Year in AU

Capt Jack D. Mattingly, Course Director, Air Conditioning Engineering Course, Civil Engineering School, Wright-Patterson AFB, Ohio, was recently named the Outstanding Junior Officer of the Year in Air University for 1972. The honor came on the heels of his selection as Outstanding Junior Officer of the Year for the Air Force Institute of Technology (AFIT).

The command award represents a first for AFIT. Captain Mattingly is the first junior officer in the history of AFIT to take the command award. He was cited for his high qualities of job professionalism, leadership ability and active civic involvement.

2 NEW DEGREE PROGRAMS FOR CIVIL ENGINEERS

Civil Engineering Facilities Program

by Maj Stewart W. Johnson, PE
Associate Professor of Mechanics

The chain of events that led to the development of the graduate Civil Engineering Facilities Program began in 1970 with a number of informal conversations between certain Air Force Civil Engineers (AFCEs) of the Civil Engineering Panel of the Air Force Educational Requirements Board and the AFIT faculty and staff. The gist of the conversations was the graduate degree programs then available were not meeting all the needs of the Air Force Civil Engineering career field. Later, Brig Gen John D. Peters and Brig Gen Archie S. Mayes asked the Commandant of AFIT to consider what kinds of degree programs the AFIT resident schools could offer to better educate AFCEs.

AFIT formed a Facilities Engineering Curriculum Development Committee in August 1972 with representation from the AFIT School of Engineering and the Civil Engineering School. This program developed by that committee, as amended by the AFIT faculty and administration, was briefed to Maj Gen Billie J. McGarvey, General Peters, and other AFCEs in the Directorate of Civil Engineering in 1972. The program was approved and will enter a quota of 20 students in the fall of 1973.

Program Includes Five Quarters

Figure 1 shows the entire curriculum. The total program includes five academic quarters plus a four-week short term. The short term is a period of review and remedial work particularly tailored to students who have been out of school for several years. Allowing for between-quarters breaks and Christmas leave, the total program requires 15 months.

Major segments of the program have been coded differently. Each student will have one major—in civil engineering emphasizing structures—and will complete two minors—one in electrical engineering and the other in mechanical engineering. The electrical engineering minor features study of electrical power systems. The mechanical engineering minor is planned

cont'd next page

Civil Engineering Facilities Management

by Maj Robert L. Sims
Associate Professor of Management Sciences

What sort of work does a civil engineer do in the Air Force? Occasionally, he will be assigned to traditional civil engineering duties. A great majority, however, will devote their time entirely to managing the allocation of civil engineering manpower and funds to accomplish the civil engineering mission. In this working environment, what kind of education should a civil engineer possess to perform well?

In 1971, the Civil Engineering Panel of the Air Force Educational Requirements Board considered this question. The panel had long felt that an undergraduate engineering degree could be nicely balanced with a master's degree in management or engineering administration. Hence, the AFIT civilian institutions program has enrolled Air Force Civil Engineering officers in MBA or engineering administration programs at civilian graduate schools. Unfortunately, such programs would average about 18 months in duration and were directed toward a civilian, industrial working environment. The Air Force student had to translate the civilian-oriented education to the Air Force working situation.

It was suggested to the panel that AFIT's School of Systems and Logistics could develop a master's degree program that could correct these shortcomings. Hence, the Graduate Facilities Management Program was born.

The AFIT resident Graduate Logistics Management Program has existed for about 10 years. Through curricular adjustments, the Graduate Facilities Management Program was created to run parallel with the Log Program, thus taking advantage of commonly needed courses. There was also the further advantage of personal contact with logistics students to broaden the scope of the educational experience.

The Facilities Program, like the Logistics Program is 12 months in duration. It is conducted at Wright-Patterson AFB by a faculty of 23 Air Force officers and four civilians. Over 90 percent of the faculty either possess doctorate degrees or are completing their dissertations. Their working and educa-

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DEGREE PROGRAMS

cont'd

to lead to an understanding of modern heating, ventilation, air conditioning and refrigeration systems.

All students need certain tools—math and technical communications skills to be effective in graduate education. There is considerable work in integrative and broadening sequences. A broadening course is one relating to some significant aspect of Air Force Civil Engineering outside the areas of civil, mehanical and electrical engineering. An example of a broadening course is corrosion. An integrative sequence is one which is designed to help students put together what they have learned in dealing with realistic problems and issues. An example is a sequence entitled Facilities Systems Integration in which students as a group will select a typical Air Force Civil Engineering problem and solve it using knowledge they have gained throughout the entire program.

Throughout the entire program there will be a specific Air Force orientation and application. Interaction between the faculties of the AFIT School of Engineering and the Civil Engineering School will assure that current problems and issues of interest to AFCEs are brought into course work.

The Facilities Engineering Seminar will extend tional experience spans the entire spectrum of logistics and civil engineering. Because of the graduate level of the courses conducted and the qualifications of the faculty, the North Central accrediting association has authorized AFIT to award a master degree upon completion of this program: Master of Science in Facilities Management.

The Facilities Program is divided into an ungraded short review term of five weeks and four academic quarters. During this review period, the student takes four courses: Quantative Preparation, Accounting Review, Analytical and Critical Writing, and Introduction to Computer Programming.

The courses offered during the academic quarters are shown in **Figure 2.** Although this is a highly structured program, the student has flexibility in choosing a selective course offered in the fourth quarter. The range of selectives includes the Analytic Subjects of Decision Theory, Simulation, Reliability Theory, Experimental Design and Mathematical Programming; Integrative Subjects are Techncial Speech and Research in Management Theory; and Functional Subjcts are Systems and Logistics, Financial Management Cases and Functional Management Cases.

The students in the Graduate Facilities Management Program are required to complete a thesis during the year. Usually, these are written by a two-man team in order to increase the scope and to improve the quality of the research. Suggested topics of prac-

Figure 1: Curriculum Outline Graduate Civil Engineering Facilities.

AREA OF STUDY	SHORT TERM (4 weeks)		FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	FIFTH QUARTER
CIVIL ENGR (Major)	FORTRAN REVIEW	MECH REVIEW	SOIL MECHANICS AND FOUNDATION ENGINEERING *	STRUCTURAL ANALYSIS *	REINFORCED CONCRETE STRUCTURES *	STEEL STRUCTURES *	QUALITY ASSURANCE *
ELEC ENGR (Minor)	BASIC ELECTRIC CIRCUIT CONCEPTS		LINEAR NETWORK ANALYSIS	ELECTRO-MECHANICAL ENERGY CONVERSION S	ELECTRIC POWER SYSTEMS * S	ELECTIVE * S	ELECTIVE * S
MECH ENGR (Minor)	BASIC THERMO-DYNAMICS AND HYDRAULICS		APPLIED THERMO-DYNAMICS	APPLIED HEAT TRANSFER *	THERMAL ENERGY SYSTEMS *	FACILITIES SYSTEMS INTEGRATION(I) * S	FACILITIES SYSTEMS INTEGRATION(II) * S
QUANTITATIVE/ VERBAL TOOLS	MATHEMATICS REVIEW		MATRICES AND VECTORS	NUMERICAL METHODS	SEMINAR IN TECHNICAL COMMUNICATIONS	CORROSION * S	
INTEGRATIVE/ BROADENING SEQUENCES			FACILITIES ENGINEERING SEMINARS S	S	S	S	S
QUARTER HOURS CREDIT (68–70 Total)	0		14	14	14	15–16	11–12

(•) GRADUATE CREDIT
(S) SIGNIFICANT CROSS-FEED BETWEEN EN-CES

through the entire program. It will be devoted to special and practical subjects and to distinguished speakers, and will involve one or two hours per week of student time during which many of the civil engineering problems unique to the major air commands will be taken up. Examples of the special subjects that this seminar will address are foundation engineering and soil mechanics, problems in arctic and tropical zones, problems in modernizing old electrical and mechanical systems in Air Force facilities, and exploring the impact of wastes from base facilities such as photolabs and wash racks upon relations with surrounding communities. This program will capitalize on the Civil Engineering School's excellent guest lecturer program which features many distinguished speakers.

In the last two quarters of the program, two graduate level electives are provided for each student. Students will select from seven offerings in management and seven in technical areas to meet special Air Force requirements or relate directly to the student's upcoming assignment. When he is ready for his electives, the faculty will usually know his end assignment and will be able to counsel him into appropriate electives.

This graduate program is multidisciplinary in nature. It provides for a wealth of broadening experience in sub-specialties outside the three main engineering disciplines in which the students major and minor. It provides experiences which help the student integrate what he has learned by solving a real life civil engineering problem in facilities and feeds back these problem solutions into the career field.

55XX Will Be Output AFSC

Students will come predominately from the 55XX career field; in all cases, 55XX will be the output AFSC. The basic admission requirement is a bachelor's degree (with a 2.5 out of 4.0 grade average in civil engineering or a degree in another engineering discipline provided the person has had some course work in structural analysis, materials science and soil mechanics). Students lacking soil mechanics but having strong undergraduate backgrounds in either electrical or mechanical engineering will be considered. Potential students not having the courses mentioned previously could take them off-duty study at local universities before reporting to AFIT.

The AFIT Admissions Office will individually evaluate the academic record of the potential student and advise him so he can make appropriate plans. The first class which begins in September 1973 will be scheduled for completion in December 1974. Successful completion will earn the student the master's degree in civil engineering. Interested officers should contact either the Palace Blueprint Office, Military Personnel Center, Randolph AFB, Texas or the Director of Admissions, AFIT/RR, Wright-Patterson AFB, Ohio. CE

QUARTER	SUBJECTS		
	ANALYTIC	INTEGRATIVE	FUNCTIONAL
I	•STATISTICS I •COST AND ECONOMIC ANALYSIS	MANAGEMENT THEORY AND ORG. THEORY	PROCUREMENT & ACQUISITION MANAGEMENT
II	•STATISTICS II •INVENTORY CONTROL AND MGT.	CONCEPTS & TECHNIQUES OF MANAGEMENT RESEARCH	FINANCIAL MANAGEMENT IN THE FED. GOVT.
III	SYSTEMS ANALYSIS	ECONOMIC ANALYSIS FOR CIVIL ENGINEERS	•MAINT. MGT. •MATERIAL CONTROL & TRANSP.
IV	← (SELECTIVE) (THESIS) →		•PROBLEMS IN ENVIRON. PROT. •HUMAN RESOURCE MGT.

Figure 2: Civil Engineering Facilities Management Curriculum.

tical civil engineering management significance are provided by the Air Force Directorate of Civil Engineering. To assist the student writing his thesis, a research course is offered in the second quarter. A thesis committee is also appointed to provide further guidance to the student in his thesis effort throughout the year.

The requirements for admission to the Graduate Facilities Management Program are:

- Three year working experience in civil engineering;
- Undergraduate grade point average of 2.50 on a 4.00 scale from an accredited institution;
- An acceptable score on the Graduate Record Examination or the Admission Test for Graduate Study in Business.

Upon completing the Facilities Management Program, the graduate may expect jobs of greatly increased responsibility at base level and on headquarter's staffs. Representatives from AFMPC/Palace Blueprint personally visit the school to determine follow-on assignments that reflect the students desires, experience, capabilities and academic performance. CE

FOR MORE INFORMATION CONTACT:

Director of Admissions
AFIT/RR
Wright-Patterson AFB, Ohio 45433

CE/FACILITIES PROGRAM

Maj Stewart W. Johnson
AFIT/ENB
Wright-Patterson AFB, Ohio 45433

CE/FACILITIES MANAGEMENT

Maj Robert L. Sims
AFIT/SLGQ
Wright-Patterson AFB, Ohio 45433

CE Course Offer

Sheppard

School of Applied Aerospace Sciences

COURSE	
Aircraft Corrosion Control (3AZ#53550-2)	FOR AFSC 53XXX
Corrosion Control Specialist (4AST53550)	
Power Production Technician (3AAR54370)	
Intrusion Alarm Systems (2ASR54250-12)	
Cathodic Protection Systems (2ASR54250-17)	
Airfield Lighting (2ASR54251-9)	
Electrical Distribution Maint (2ASR54251-10)	
Arresting Barriers (2ASR54350-1)	
MB-Team Generator (16/18) (2ASR54350-5)	
Electrical Power Production (2ASR54350-6) (Aleutian DEW line)	
Electrical Protective Devices (2ASR54350-11)	FOR AFSC 54XXX
MB-Teen/EMU Generators (2ASR54350-35)	
Diesel Engine Governors (2ASR54350-7)	
Refrigeration & Air Conditioning (3AZR54550) Controls (M-H)	
Refrigeration & Air Conditioning (3AZR54550-1) Controls (Johnson)	
Refrigeration & Air Conditioning (3AZR54550-2) Equipment	
Central Heating Plant Specialist (3AZR54750A)	
Aircraft Arresting Barriers BAK-12 (4AST54350-5)	
Site Development & Surveying (2ASR55350-2)	FOR AFSC 55XXX
Real Estate & Cost Management (2ASR55470-5)	
Programs & Work Control Technician (2ASR55570)	
Civil Engineer Inspector (3AZR55000)	
Pavement Maintenance Specialist (3AZR55150)	
Base Civil Engineering Quality (4AST55450) Control/Evaluation	
BCE Management Training (4AST55570)	
BCE Planning Technician (4AST55570-1)	
Demineralized Water Plant (2ASR56350-5)	FOR AFSC 56XXX
Sewage Plant Operation (2ASR56350-7)	
Industrial Water Treatment (2ASR56350-8)	
Field Water Purification Plant (2ASR56350-10) Operator (600 GPH)	
Pest Control (SEA) (2ASR56650-2)	
Application of Herbicides (2ASR56650-3)	
Disease Vector & Pest Control (3AZR56650) Technology	
Water/Waste Processing (4AST56350-1)	
Pest Control (4AST56650-1)	

Other Officer Courses:

- Utility Contract Negotiation and Administration (1 week, 3 days), Lowry AFB, Colorado.
- Financial Management for Managers (1 week), Rock Island, Illinois.
- Base Procurement/BCE Related Management (8 days) AFIT/SOSL, Wright-Patterson AFB, Ohio.
- Union Management Relations (2 weeks), Gunter AFB, Alabama.

Wright-P

Civil Engin

ENGINEERING TE

Air Conditioning I (4 wks): fo
Air Conditioning II (3 wks): f
Mechanical Engineering (4 wk
chiefs; E&C section chiefs.
Electrical Engineering (3½ w
chiefs; E&C section chiefs.
Building Systems Engineering
architect in E&C branch.
Corrosion Control (2 wks): fo
Electrical Engineering (4 wks):
Environmental Protection (2
mental protection & BEEs.
Pavements Engineering (2 wk

MANAGEMENT AP

Base Civil Engineering (2 wk
& civilian equivalent.
Base Civil Engineering Staff (
Commanders CE Orientation
commander or deputies.
Executive Engineering (5 wks)
IE Management Applications
IE Techniques (5 wks): for th
IE degree.
O&M Management Applicat
O&M branch.
Programs Management Appl
programs branch.

Educat

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TECHNOLOGY COURSES

s): for the design engineer.
ks): for the experienced ME.
(4 wks). For the E&C and O&M branch
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½ wks). For the E&C and O&M branch
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ering (3 wks): for the engineer or
ch.
): for the corrosion engineer.
wks): for the design engineer.
(2 wks): for the CE OPR environ-
EEs.
2 wks): for the pavements engineer.

T APPLICATIONS COURSES

2 wks): for the newly assigned officers

aff (3 wks): for the BCE and deputy.
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wks): for the senior managers.
ions (5 wks): for the chief of IE branch.
or the IE branch members without

olicatio (2 wks): for the chief of

Applications (2 wks): for the chief of

Chanute
School of Applied Aerospace Sciences

COURSE

Fire Protection Specialist (3ABR57130-1) (8 wks): designed to train airmen to 57130 AFSC.

Fire Protection Specialist (missiles) (3AZR57150-1) (2 wks). For Sergeants or higher with 57150 AFSC or higher with minimum 3 yrs service in fire protection: GS-5 and above with minimum 3 yrs service.

A/S 32P-2 Firefighting Vehicle Operator (2 wks) (3AZR57150-2): For selected Air Force personnel.

Fire Protection Technician (3AZR47170) (4 wks). For military with 57170 or 57910 AFSC, and civilian equivalent.

Fire Protection Supervisor (3AAR57170-1) (4 wks). For AFSC 57170 or higher with minimum 3 yrs service.

Crash Firefighter (2ASR57150) (3 wks). For selected personnel.

AS/32P-4 Fire Truck Operator (2ASR57150-2) (2 wks). For selected personnel.

Firefighter Rescueman (2ASR57150-3) (4 wks). For AFSC 57150 or 57170 or civilian equivalent.

Fire Alarm Systems (2ASR57150-9) (2 wks). For selected personnel.

A/S 32P-2 Firefighting Vehicle Operator (2 wks) (4AST57150). For AFSC 57150 or 57170 or civilian equivalent with 2 yrs continuous service.

Firefighting Operation P-8 (4AST57150-1) (3 days). For selected personnel.

Arson Techniques (4AST57150-2) (1 wk). For AFSC 57150, 57170, 57190 or civilian equivalent.

A/S Firefighting Vehicle Operator (2ASR57150-2) (2 wks). For selected personnel.

Fire Prevention Technician (3AZR57170) (2 wks). For AFSC 57170 or 57190 or civilian equivalent. SSgt/GS6 or higher with minimum 3 yrs experience.

cation is Everbody's Business!

*Offerings presented here are described in capsule form. Consult AFM 50-5 for class schedules, complete prerequisites, letters of eligibility, application procedures, enrollment information, fund citations and student reporting instructions.

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Sheppard

School of Applied Aerospace Sciences

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Intrusion Alarm Systems (2ASR54250-12)	
Cathodic Protection Systems (2ASR54250-17)	
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Building Systems Engineering architect in E&C branch.
Corrosion Control (2 wks): fo
Electrical Engineering (4 wks):
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Pavements Engineering (2 wk

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Base Civil Engineering (2 wks & civilian equivalent.
Base Civil Engineering Staff (
Commanders CE Orientation commander or deputies.
Executive Engineering (5 wks):
IE Management Applications
IE Techniques (5 wks): for th IE degree.
O&M Management Applicat O&M branch.
Programs Management Appli programs branch.

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): for the corrosion engineer.
wks): for the design engineer.
(2 wks): for the CE OPR environ-
EEs.
2 wks): for the pavements engineer.

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Fire Prevention Technician (3AZR57170) (2 wks). For AFSC 57170 or 57190 or civilian equivalent. SSgt/GS6 or higher with minimum 3 yrs experience.

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Children romp in the playground in front of the new school facilities at Rhein Main AB, Germany. At the right is a typical interior view of a classroom, complete with slate blackboards, furnished by the contractor, and an apple on the teacher's desk, furnished no doubt by an admiring pupil.

Classroom facilities at Rhein Main AB were ordered abandoned in February. New facilities — procured, manufactured, shipped, delivered and erected — were promised within six months! The situation was urgent. Here's the remarkable account of how engineers and others met the challenge.

TEAMWORK BUILDS A NEW SCHOOL

by Col Stanley A. Kachel

When the order was issued to abandon the elementary school facility located near the landing zone to Rhein Main AB, Germany as being unsafe for pupil occupancy, the decision caused a flurry of activity that involved not only Air Force Civil Engineers but also Congressmen, officials from the Office of the Secretary of the Air Force, and other Air Force and Federal agencies. Their combined talents, pooled together, resolved an urgent problem that can only be described as teamwork at its best.

For Air Force Civil Engineers, dealing with an

urgent project classification can be a numbing experience. All understand the factors which are associated with this type of work. At Rhein Main AB, the situation was, simply stated: Take 625 elementary school children and place them in World War II German facilities that are located in the hazardous landing zone for aircraft where the noise alone is deafening. Add the irate parents, the attention of Congressmen and officials of the Secretary of the Air Force, and a promise by these officials that the children would be in new facilities beginning with the next school year. Here, you have a real definition of urgency.

For years, the elementary school facilities at the base were overcrowded. To ease the condition, World War II German facilities on the base were opened up to handle the student overflow. Unfortunately, the facilities were too near the busy Frankfurt International Airport. In addition to being located in the hazardous landing zone, noise from the aircraft reached levels which compromised instruction and also posed a threat to hearing. Thus, the facility was abandoned as unsafe for pupil occupancy in February 1972. The next month, the primary school was closed and, for three days, grades 1 through 6 were terminated at the main school until schedules and facilities could be rearranged to handle the 625 displaced pupils. When school reopened, double sessions were instituted in the main school building, with intermediate grade students attending classes in the base's housing area and the old Rhein Main Education Center.

While this was occurring, officials visiting Rhein Main made the promise to parents that new facilities would be available by September 1972. To make good on the promise, the Director of Civil Engineering was tasked to find the solution which would honor the commitment made.

High Level Interests Involved

The school facility problem within USAFE was known for years. Prior efforts to obtain new school facilities had been attempted but were unsuccessful. Now, the high level interest and support needed to solve the immediate problem was involved. Plans to program permanent new facilities to correct deficiencies were started. At the time action was initiated to resolve the immediate problem, a line item for the school at Rhein Main was included in the FY 1973 Air Force budget. Obtaining this new facility would be the ultimate solution and anti-climatic to what was achieved to satisfy the September 1972 commitment.

Logisticians, after being briefed on the urgent need for the school facilities, were most helpful in determining the most expedient way of funding the procurement of the buildings. Funds were transferred to the Defense Construction Supply Center (DCSC) at Columbus, Ohio, as the first step in the project. Concurrently, civil engineers developed a 1391 for the funded costs of site preparation, foundations and utilities. This particular project was processed at the same time procurement action was underway. While this might appear unusual, concurrent action was the only way this project could be moved to assure some reasonable success of meeting the September 1972 need date. OSD project approval was obtained at about the same time a request for proposals (RFP) was issued by the DCSC.

In advertising for bids, the DCSC procurement function specified a 30-day time period for the return of proposals. Normal procedures had to be shortened to reassure that there would be a reasonable chance of meeting the September need date. Therefore, a shortened bid period was requested to which DCSC agreed; bids closed and proposals were in DCSC on 25 April.

COLONEL KACHEL *is an Air Staff Program Review Committee Representative, Programs Division, Directorate of Civil Engineering, Headquarters US Air Force, Washington, DC. A graduate of the University of Illinois with a bachelor of science degree, he has held many important positions at all command levels. A pilot in World War II, he was recalled to active duty in 1952 as a civil engineer.*

Two days later, technical evaluation of the bids submitted was being made at Columbus, Ohio. Joint participation by the Directorate of Civil Engineering and DCSC personnel at this point saved a valuable three to four weeks because of problems which arose in the bid documents. The specifications as written, which accompanied the RFP, set forth standards to which the bidders could not adhere. Their production, in most instances, was geared to a product superior to the specifications developed in the RFP. This resulted in proposals which bid the project in accordance with the specifications at higher prices and less quality than the actual product being produced by the manufacturer. At the outset of this review, it was apparent that in the process of bidding the RFP, the manufacturers bidding did not bid the specifications. Instead, exceptions to the RFP were submitted which threatened to delay an early contract award. Ordinarily, when this type of situation develops, the only recourse is to withdraw and issue a new RFP with specifications and a request for bids as an exception to the specifications. In a hurried 24 hours, companies submitting bids were contacted to resolve this problem. It was resolved, permitting us to get on to a favorable, technical evaluation of the contractor's manufactured facilities.

After negotiation with the contractors regarding the specifications and price, a contract was awarded on 15 May 1972 for the procurement of 25 classroom

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NEW SCHOOL

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units. The contract specified a delivery date of 120 days after notice to proceed.

This delivery schedule did not aid in resolving the problem of how to get the displaced children in school by September 1972 when a delivery date at the outset put the project 30 days behind schedule. The problem was briefed to representatives of LCA Modular Enterprises, Inc., Ft. Wayne, Indiana. The executive vice president made it clear that his company would expend an all-out effort to expedite delivery. It is a most noteworthy achievement that the company increased its production schedule so that the units were delivered to the Air Force in time for shipment to Europe to meet the need date.

The final units that were settled upon in the contract can be described as a well constructed, conventional-type building with one exception: it rolls on wheels, if necessary. The overall dimensions of a single school building are 20 by 36 feet. The building is comprised of two half units 10 by 36 feet which are bolted together to make the unit. The two half units are never interchangeable with another unit because of the method used in joining the two half units together. Construction of the units is conventional but of a durable nature.

The first step in production is to weld together a box section steel beam chassis under the frame which supports all bearing walls and which also acts as the member to provide the over-the-road capability. The box beams are 3 by 9 inches and are more than adequate support for normal construction. There is a well in the steel beam box chassis which receives a six wheel dolly. When the unit is to be moved, the building is lifted on one end by a fork lift and, while about four feet off the ground, the dolly rig is rolled under the building into the welled cavity, aligned, and the building gently lowered onto the dolly. No further attachments are made. The weight of the building and scheduling over good roads is the only thing that prevents this building and dolly from separating.

After the beam channel chassis is welded together, the two half units which comprise the total building are butted and bolted together with conventional construction. Beginning at the steel box channel chassis, a 3.8 inch asphalt impregnated, moisture resistant insulation board is laid over the chassis. The floor is insulated with 4 inch paperback insulation and vapor barrier. The joists are overlaid with 5/8 inch plywood flooring which is plugged and touch sanded. Vinyl asbestos floor tile, 1/8 inch by 12 inch by 12 inch, is then glued to the floor. At the time the floor is built, the sidewalls and roof are

At Bremerhaven, Germany, a half-unit of one building is unloaded, aided by a spreader bar and sling assembly unit.

framed in jigs adjacent to the floor assembly. When the framing is complete, the structural members are placed on the prepared floor, nailed and bolted in place with the final elements of the interior and exterior finish treatment being applied. Wall construction is normal 2 x 4s, 16 inches on center.

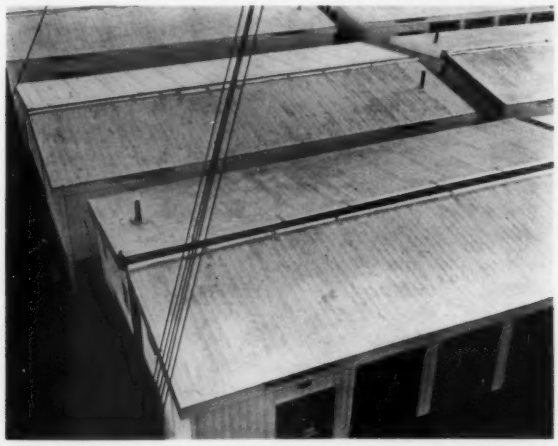
At the point where the two half-units come together at the ridge line of the building, a 36 foot by 12 inch bar joist is placed in each half unit which spans the length of the building. The bar joist rests on 3 5/8 inch structural steel pipe in the end wall of the building. The distance between the double wooden plate of the sidewall to the bar joist is spanned by 2 x 6 roof rafters. At this point, the building has been framed out and awaits the finish. Sidewalls as well as the roof are all insulated with 4 inch paperback mineral insulation. The exterior walls are of panel construction with outer skin being 3/8 inch hardboard, glued and stapled to wood structural members to form a single structural unit of floor, sidewall and roof.

The interior skin is prefinished, 3-ply plywood, which is able to resist the strongest kicks and scuffing tendered by school children. It has a Class C fire rating. The exterior or outer skin is .024 rigidized aluminum on 3/8 inch hardboard with baked enamel finish. The aluminum is attached to the building by cadmium plated steel screws. The roof is ½ inch insulation board with a pitch of 7/8 inches per foot, overlaid with a final roof deck of 26 gauge galvanized steel with lock seams joining the individual sections of the metal deck. It is treated with a coating of aluminum impregnated mastic which seals, deadens and serves as a heat reflector. There is a drop ceiling of fireproof material with recessed lighting throughout the building.

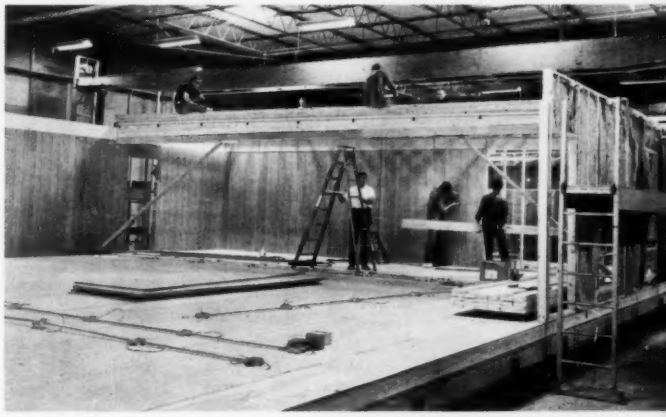
Each building is self-sufficient. There is central heating and air conditioning in each unit, a closet for teaching supplies and two latrines. In anticipation of the 110 volt, 50 Hertz power used at Rhein Main, wiring for the outlets was left dangling for installation of the European type receptacle. Ballasts in the fluorescent fixtures were changed for the 50 Hertz power as well as the motors in the heating and air-conditioning units.

LCA Modular Enterprises, Inc., increased the production schedule to assure delivery of the units to the Air Force by mid-August. Moving up on this date, consideration had to be given to the mode of transportation needed to get the units to Germany—again in time to meet the need date. In June, action was taken to obtain C 124 airlift of the units to Rhein Main. However, this mode of transport had to be shelved because the size of the units would not clear through the front end of the aircraft.

Each 10 by 36 foot half-unit was matched with its other half and loaded on the ship at the New Jersey port.



This close-up view shows some major construction features during assembly of a unit in the manufacturers plant.



The only other aircraft available to satisfy the airlift requirements was the C 5. While preparing to obtain C 5 airlift, notification was received that the expedited delivery schedule, when interfaced with surface transportation via the MTMTS SS Callahan ship, would enable us to plan surface transportation all the way to Rhein Main. The matter of transporting the school units over the road to the port in New Jersey, loading them and getting them to Germany was another object lesson in cooperation and ingenuity which went into the success of this particular project.

To preclude correction of minor deficiencies becoming major detriments to the production schedule, the project officer agreed to accept full responsibility for acceptance of units with deficiencies so long as they did not affect the structural integrity of the building. It was felt that minor deficiencies accepted at the

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NEW SCHOOL

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plant would be a major trade-off to the accelerated delivery schedule.

As the buildings rolled off the assembly line, fixtures and doors in the buildings were removed and packaged, preparatory to shipment. At the same time, the open side of the half unit had plywood installed over the opening. Plywood was also placed over windows and doors to prevent damage in transit. The units were ready for over-the-road hauling to the port destination in Bayonne, New Jersey. Earlier, it was decided against rail shipment because the units could not endure the bumping of rail cars without extensive bracing to assure that the plumb and square of the building was not warped.

Towing Presented Problems

Towing the units over the road became another problem. Because of the outsize of the building, the units could not be towed over the road during darkness, or during weekends or holidays. Federal and state waiver of this restriction was requested. If not granted, units would not get to the port to meet the first shipment in mid-August. The interface of production, to towing, to delivery at the port for ocean shipment became a major issue. Unfortunately, the success attained was degraded because the ship was not to make the scheduled sailing date because of a broken turbine. The three day delay encountered would have provided enough latitude in the interface schedule to meet the delayed sailing.

At the time CONUS transportation problems were being resolved, another one struck, but this time in Germany. The German Bundesbahn (railroad) had been advised that we would be moving these buildings over their railroad to a railhead at Rhein Main.

A redwood shield, built around the foundation of a completed unit, keeps children from crawling under building.

Plans were methodically developed to route the train over track which would not restrict movement of the outsize cargo. (Since European trains are built and handled differently than in the US, bumping was not a problem.) The planning factor used for the size of the building on the flat car was 10 by 36 feet; however, one detail was forgotten in our statement of width: the over hang. What a difference a few inches can make! In this case, it looked like weeks while new routing was planned since routing had to be acknowledged by every city, village and gate tender enroute to Rhein Main. A simple modification to the building resolved part of this problem while some fine liaison by USAFE transportation with the Bundesbahn resolved the remainder. In August, units began to roll over the road to Bayonne, New Jersey. In a few days, all units were at the port awaiting loading aboard the SS Callahan.

Problems arose at the port too. Items were jerry rigged in order to lift the units onto the deck of the SS Callahan. Special precautions were taken in orienting each unit on board and lashing each one securely to prevent planing. In retrospect, 28 to 30 knot speeds plus head wind components can produce effects akin to an airfoil. Because of the special precautions taken, the buildings did not end up flying into the Atlantic Ocean.

A Final Unusual Experience

Even though the remainder of this experience is fairly uncomplicated, one final, unusual experience occurred. On the return voyage from Bremerhaven, Germany, to pick up the second increment of units, notice was received that the Captain of the SS Callahan was slow sailing his vessel on the return voyage to break in his new turbines. Consequently, advice was given that another delay in the scheduled sailing date for the second and final shipment would be encountered. This delay could be two to three days. A situation now existed which threatened to break that commitment made to parents—unless we could do something about that slow journey back to the US. A call was made to the officer heading the MTMTS to obtain his approval for full steam ahead on the SS Callahan. He agreed. The message was relayed to the Captain, speed was brought up to 28 knots and the shipping was back on schedule.

All units arrived at Rhein Main in good shape and on schedule. Considering the travel and handling which the units received, it was something other than luck which produced these results. A group of dedicated people, giving diligently and conscientiously of themselves and their skills, produced what was observed in mid-September 1972 when the ribbon cutting ceremony was conducted for the relocatable classroom complex at Rhein Main AB, Germany.

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Marked increases in rated officers in the civil engineering career field have been noted. Under TOPLINE of the Personnel Plan, the supplement category has been established at 20%, safeguarding career progression opportunities for all civil engineering officers.

The Rated Supplement: A New Dimension to the Officer Force

by Lt Col Bobby G. Yow, PE

The number of rated officers serving in the civil engineering utilization field has steadily increased for the past two years, and the result has been increased concern to both the rated and nonrated officers. The nonrated officer often believes his career progression opportunity is reduced while the rated officer is apprehensive about changing to a new career field in which he has no experience. The purpose of this discussion is to explain the concepts of the program for managing rated officers in nonrated duties, known as the rated supplement, and the effect of the rated supplement on the civil engineering career field and individual officers.

The US Air Force Personnel Plan, which was approved in 1970, provided the basic frame work for all future Air Force personnel policies. Volume II of the Plan, called TOPLINE, is devoted to the officer structure and includes rated supplement management. The rated supplement is defined as rated officers (lieutenant colonel and below in Flying Status Codes 1 and 3) assigned to nonrated duties or attending AFIT, professional military education (PME) or technical training schools. It is primarily designed as a resource of rated officers to be withdrawn back to the cockpit to meet the increased rated requirements which occur in the first phases of future contingencies. Each of the nonrated fields has a certain percentage of its authorizations—from 10 to 50 percent—designated for supplement officers as specified in TOPLINE. The supplement category for civil engineering has been established at 20 percent. A pilot/navigator goal for each specialty is established and then further divided into goals for each major command, based on its share of the authorizations.

The movement of rated officers into, within and out of the supplement is centrally managed by the Air Force Military Personnel Center (AFMPC). This control of the supplement, according to established goals, is done for two reasons. First, when the supplement officers are returned to rated duty because of a contingency, the adverse impact of their withdrawal on their nonrated field will be greatly reduced. Secondly, the visibility and career opportunities of the nonrated officer are maintained. The following control procedures and policies have evolved since the initial establishment of centralized control of the supplement in June 1970.

The movement of a rated officer into 55XX duties can be accomplished through several avenues.

- Officers with appropriate academic backgrounds may request a duty AFSC change to 55XX (AF Form 2095 through CBPO assignment section IAW para 1-19, **AFM 36-11**).
- Completion of an AFIT program with an output AFSC in 55XX will result in a directed duty assignment in the 55XX supplement.
- All rated officers who are on the move (completing overseas or CONUS stabilized tours) are screened by AFMPC and qualified officers are considered for 55XX duty.
- An officer who is not on the move, but qualified for 55XX duties may be identified by the local commander or by the major command for movement to a civil engineering position within the command.
- Finally, AFMPC may levy the major commands for officers qualified to move into the 55XX supplement. Each of these avenues of supplement entry requires AFMPC approval.

An important factor in supplement management is maintaining the identity and control of the rated officer while in a nonrated job. For this purpose, when

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The Rated Supplement:

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a pilot or a navigator is assigned to 55XX duty, two data items are entered into the individual's Uniform Officer's Record (UOR). The first item is the **Rated Supplement Availability Code.** If the officer meets the **AFM 60-1** flying excusal criteria, he is coded "Controlled Rotation" (code C) and is excused from flying while he is in the supplement (without loss of flight pay). It is these officers who are the last to leave the 55XX field during contingencies and are rotated on a one for one basis – for each withdrawn, one enters the supplement as a replacement. If the officer is not eligible for excusal from flying, he is coded as "Surge" (code A—withdrawal within first six months of increased rated requirements) or "Drawdown" (code B—withdrawal between six and 18 months.) Neither of these two groups are necessarily replaced. Surge/-Drawdown officers must continue to fly for proficiency (meet **AFM 60-1** minimums) because they are the first to return to flying jobs in the event of a contingency.

Code, Date Are Protected Data Items

The second data item in the UOR is the **Rated Supplement Completion Date.** The completion date of a supplement officer overseas or on a CONUS stabilized tour will coincide with Date of Return from overseas (DEROS) or with his stabilized tour completion date. The completion date (year/month) of all other supplement officers is normally three years from the month they are assigned into the supplement. Commitments incurred by completing an AFIT Program or being reassigned to another supplement job could result in the officer being extended in the supplement beyond his completion date and this must also be carefully controlled. Therefore, both the supplement availability code and completion date are AFMPC protected data items in the UOR and can be entered, changed or removed only by AFMPC.

Every supplement officer is reviewed for return to rated duty prior to his completion date. Those officers overseas or on stabilized assignments must be reassigned by AFMPC at the end of their tours. They receive their supplement review at the start of the reassignment cycle nine months prior to their tour completion. Review of officers not on stabilized tours or overseas begins earlier—12 months prior to completion date. If he is selected for rated duty, his major command is notified and he is advised to update his AF Form 90 to reflect his rated preference. Nine months prior to his completion date, his records enter the normal nine month assignment cycle and his assignment is worked by the AFMPC rated management team. If an officer is selected for retention in nonrated duty, his completion date is extended.

The decision logic used during the review to determine whether an officer is, or is not, selected for return to rated duty is based on manning requirements and TOPLINE philosophy. Because of present and near-term projected rated field grade manning, majors in the primary zone for promotion to 0-5, and lieutenant colonels are normally extended in the supplement if they have qualified for their advanced aeronautical rating, are SEA/remote ineligible, and are performing well in their nonrated field. Remaining supplement officers are normally returned to rated duty if they have been in the supplement three or more years on their completion date. This insures that the young rated officer is returned to rated duties to update his operational expertise and proficiency.

You are probably wondering by now how this adds up to better resource utilization and equitable career development. First, it is important to emphasize that the rated supplement is not new. There has always been a requirement to assign rated officers to nonrated duties. The difference is that it is now done according to a planned, controlled program. For example, in 1964, 24 percent of the civil engineering officer authorizations were filled by rated officers and the majority of these were field grade officers. ("AF Civil Engineer Officer Population Study", **Civil Engineering Center,** AFIT, July 1965.) Under TOPLINE, the total number will be limited to 20 percent and these positions will be spread equitably among the year groups. This precludes an unacceptable influx in any one year group or level and thus safeguards the career progression opportunities. In effect, it insures the availability of senior management positions for the nonrated officer.

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For the rated officer, it affords the opportunity for planned career broadening and executive development while maintaining his rated expertise. Selection of rated officers for career broadening assignments in the civil engineering supplement will be made on the basis of merit, potential, qualifications and personal desire. Assignments are selected which will insure maximum utilization and development while the officer gains civil engineering experience. This will provide the civil engineering utilization field a well-quali-

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The need for strict financial management is critical since the Base Civil Engineer spends a significant portion of his base's annual operating budget money. What follows are timely tips on . . .

Managing Your Bank Roll Better

by Maj Norbert A. O'Hare

Gen John D. Ryan, Chief of Staff of the Air Force, has characterized the 1970s as a challenge to Air Force managers in the following statement: "The resources needed for continued security will be provided if the people are convinced that their investment in the defense of the future still is essential and will be administered with wisdom and without waste. The problem, then, is essentially one of management in the broad sense of the word, establishing goals, planning the wherewithal to reach them, and administering the allocated resources with unimpeachable efficiency."

General Ryan is appealing to those of us who are resource managers to efficiently and effectively discharge our duty in using and managing the taxpayers' money. We are finding that in this age of austerity and strict financial consciousness that this is a demanding and difficult task. The Department of Defense (DoD) has billions of dollars invested in hundreds of facilities located on numerous Air Force bases world-wide. Records show that the cost of operating, maintaining and managing these facilities is close to a billion dollars per year, and over the last decade, these costs have increased at a greater rate than the funds made available by Congress. Resource managers are therefore confronted with stretching the dollar—doing more with less.

Management Is Critical

As a Base Civil Engineer (BCE), you play a unique role in dollar resource management because you command one of the major responsibility centers on base and spend a significant portion of the base operating budget money. To cope with the situation of the increasing cost of doing civil engineering business, the need for strict financial management is critical.

Although this task is awesome, it is not insurmountable. With dedicated effort and careful attention to the areas of resource management, we can be assured of some success.

First, with the introduction of new management techniques and procedures, continuous education and training is necessary in civil engineering. This is particularly true in the aspects of financial management. An important task for a BCE is to insure that he, his functional managers and other responsible staff members are thoroughly knowledgeable in their area of dollar responsibility. To be competent in the day-to-day job of managing funds, resource managers must have a working knowledge of the Air Force side of the DoD Resource Management System (RMS) (the terminology, the data flow, the components) as applied to base level activities.

This need for funds management training at base level has been recognized at Headquarters US Air Force which has tasked major commands to insure that RMS training is available or will be made available by the Base Comptroller under the auspices of **AFM 178-430,** Cost Center Performance Measurement System (B3500). Headquarters US Air Force has requested civil engineering staffs to work with their comptroller counterparts to establish formal training requirements to provide at least annual recurring RMS training. Not only is this a golden opportunity for civil engineering managers to prepare themselves to cope with today's austere funding situation, but it also is like receiving free professional advice from your banker regarding investing and managing your hard earned dollars. Solicit the base bankers help by making our RMS training needs known. Once this training is started, don't let it die: use it as a refresher for the "old heads" and orientation for the newcomers. This training can be supplemented by command workshops which provide the opportunity to express base level needs, exchange ideas and learn better management procedures.

Until the formal training is available, the Resource Manager's Handbook, **AFM 178-6** is a reliable source of RMS information. It describes the Air Force financial management process in general terms and relates this process to base level financial management activities.

Next, conscientiously and accurately identify total work requirements in support of the assigned mission from which a finely-tuned Annual Work Plan (AWP) can be realized. The AWP should be complete and detailed enough to permit each base to identify the operations and maintenance dollars required for the upcoming fiscal year and provide compatible backup data for justification of needs. The In-Service Work Plan (IWP) portion of the AWP should identify the in-service manhours required and the cost of the material and equipment needed to accomplish the

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Bank Roll *cont'd*

planned workload. The Contract Work Plan (CWP) portion should list validated requirements and costs for operations and maintenance (O&M) contract projects along with the routine service and utility contracts.

The budget is the vehicle for communicating base money needs up through the major commands to Headquarters US Air Force for eventual presentation to Congress. This budget must be able to withstand severe scrutiny at all levels and, at the same time, advertise the dollars needed to support the civil engineering work force. The necessity for a viable program which supports operating budget needs through a detailed IWP and CWP cannot be overlooked. The quality of this base level effort can be the key step to successful financial management. Within this planned framework, BCEs must manipulate the limited dollars Congress appropriates.

Once the AWP has been accepted by the base Facilities Board, attention can be directed to preparing and submitting to the base comptroller specific dollar requirements for supplies/materials, equipment items and base utilities. These requirements are presented in two parts:

- Showing what dollars are needed to cover direct operating expenses funded from O&M Appropriation dollars;
- Including expenses associated with providing services on a reimbursable basis.

At this point, bases must be careful to identify all reimbursable activities such as military family housing, redistribution and marketing, industrial fund activities and nonappropriated fund activities. If authorized reimbursable expenses are not a part of the budget request, scarce O&M Appropriation money for supplies and equipment will be obligated but not recouped through the earned reimbursement program. In other words, BCEs will be losing direct O&M dollars which in reality should be budgeted and paid for by money other than O&M money. If this fact is not considered, the budget request will be imbalanced and could possibly shed doubt on the authenticity of the BCE portion of the base operating budget. Additionally, the reimbursement expenses anticipated cannot possibly be earned in the amount budgeted. This fact may stimulate doubt and embarrassing questions from the base financial management committees.

Each fiscal year, Congress passes an appropriations bill that permits the Air Force to obligate the Treasury of the US for the expenditure of dollars made in behalf of mission support. The O&M Appropriation money used to pay for civil engineering services is subsequently apportioned through commands to bases by quarters over the fiscal year. At base level, two financial management committees are responsible for judiciously requesting, using and managing the taxpayers' dollars alloted in the apportionment.

The Financial Management Board (FMB), chaired by the senior or host commander, is composed of top-level base managers. (BCE can act as the technical advisor to the base commander during committee meetings.) This board meets quarterly to review the status of overall financial programs directed toward mission accomplishment.

The Financial Working Group (FWG), chaired by the base budget officer, is composed of Responsibility Center (RC) managers such as the civil engineer, supply officer and transportation officer and their funds managers. This group meets monthly to consider base operating budget requirements and makes funds management recommendations to the FMB. Since the FWG is the BCE's vehicle to communicate his dollar needs to the FMB, active participation affords another opportunity for civil engineering to enjoy financial success.

The Financial Management Committees provide the key to base level financial management success; the BCE's funds management specialist is the key to the financial success of civil engineering. The person occupying this critical position is responsible for the civil engineer's money life-line. He asks for dollars through budgeting, determining where to place the dollars allocated and keeps track of actual expenditures. In short, he serves as the focal point for the management of the various funds required by the BCE.

Idealistically, the BCE's Funds Manager should be someone with previous experience in the accounting and finance (A&F) system, someone who is enthusiastic and conscientious and someone with the right personality for the job. Knowledge of and experience with the A&F side of the house should provide the BCE in-house understanding of such matters as the Resource Management System (RMS), the BEAMS/A&F cost integration and base level budgeting. An enthusiastic person with a conscientious attitude will provide the momentum and attention to detail necessary to keep tabs on day-to-day expenditures. One of the primary aspects of effective and successful financial management is dealing with people on a daily basis. The civil engineering funds manager must have the

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type of personality to deal effectively with his co-workers and with the funds managers from other base support agencies. He should be a "man-for-all-seasons" for funds management.

Realistically, the BCE cannot count on finding the ideal funds manager. He must look to his in-house resources to fill this position and select an enthusiastic, competent, conscientious and willing civil servant or NCO with some previous financial experience. Individuals filling a 554XX or 555XX AFSC position are likely candidates. Idealistically or realistically, select the best person available for he is worth his weight-in-gold.

The first step in the management of the apportioned O&M funds is the establishment of realistic targets for spending. Now is the time to tell the base treasurer, the base comptroller, where, when and how many dollars we want to spend by Element of Expense Investment Code (EEIC). This targeting by EEIC provides the detailed accountability vital to spending limited dollars. These targets are the vehicles for keeping an up-to-date position on the status of civil engineering funds through the RMS.

Reports Are a Must for BCE

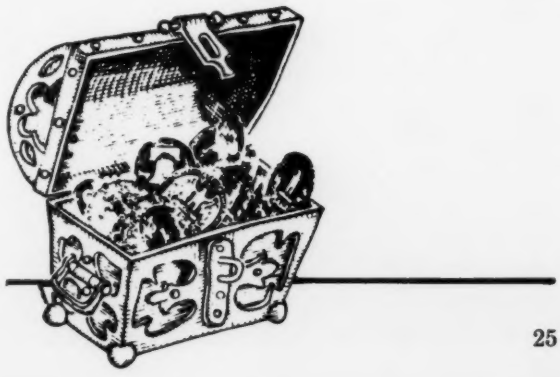
The monthly automated products of the RMS provided by A&F are a primary tool for use in managing civil engineering dollars. The Responsibility Center Manager Monthly Report, one of several reports available, is a must for the BCE manager. This particular report tells us how we are actually spending the dollars we planned to spend by EEIC on a quarterly and annual basis. This data is valuable in making financial management decisions, in reevaluating and adjusting cost targets, in justifying additional dollars and in budgeting for the next fiscal year. An optional report, the Responsibility Center Manager Cost Center Report, arrays the same data for use by cost center managers. The content and use of these and other reports concerned with base level resource consumption are explained in detail by **AFM 178-6.**

A financial management area demanding the close attention of the funds manager is that of reimbursements. The budget for reimbursable expenses should be prepared using only that portion of a cost center's shop rate that represents funded costs. Unfunded costs such as military labor are not reimbursable. Therefore, if the carpenter work center has five military and five civilians assigned, the military factor is 50 percent (5/10) and only 50 percent of the shop rate cost will be reimbursed. So, when budgeting for reimbursements only that percentage of the shop rate that can legally be reimbursed should be included. Since we must initially purchase the materials and pay for the manhour resources using civil engineering capital, we must insure that (1) we identify all areas from which we are entitled reimbursements (2) anticipate and include these reimbursable areas in operating budget requests, and (3) insure that we recoup the reimbursable dollars. Accurate shop rates, close attention to Base Civil Engineering Reimbursement/Refund Indicator codes and timely processing of the monthly Schedule of Reimbursement and Refunds is mandatory. The funds manager, with the assistance of the cost accounting section, should manage reimbursements from the time civil engineering starts work until payment is received for services rendered.

With the introduction of Base Engineer Automated Management System (BEAMS) in 1969, civil engineering shop rates have become a way of life. Shop rates including engineering and construction functions are critical to reimbursements and must be accurate and realistic for the costing of civil engineering in-house work force efforts. Therefore, the funds manager must closely monitor the development and use of these cost center shop rates. He must verify that shop rates are based on accurate data supported by known requirements. With the aid of the Shop Rate analysis Reports (Parts I, II and III) generated by BEAMS, the funds manager can compare shop rate distribution based on actual dollar expenditure to that estimated by civil engineering. When a significant variance exists, detailed analysis and possible adjustment of the shop rate should be considered. Bad shop rates can lead to problems for the best of financial plans.

A final step in the financial management process concerns providing data with which to evaluate financial management performance. The RMS provides civil engineering with historical cost data for use in budgeting for the next year, data to manage expenditures by quarter during the current year and data to promote cost awareness and management efficiency at all times. The accuracy and completeness of this data depends on the quality of accountability for items such as civil engineering manhours expended and materials used in mission accomplishment. This year's accounting has a direct effect on next year's financial program.

Never has financial management been more critical than in this time of austere funding. If we as civil engineering resource managers are to meet General Ryan's challenge and do a credible job of efficiently and effectively managing the taxpayers' money, careful attention must be directed to the facets of resource management mentioned. These are not all inclusive by any means. However, awareness and consideration to at least these areas may help make you a successful financial manager. CE



Keeping it simple was the aim of engineers at Pease AFB when they undertook a modification to a hydrant outlet of a refueling/defueling POL control system. They succeeded with a revolutionary magnet switch device that cost only 10 cents. Here's their way of eliminating . . .

The Troublesome POL Bad Guys

by George O. Baker, PE

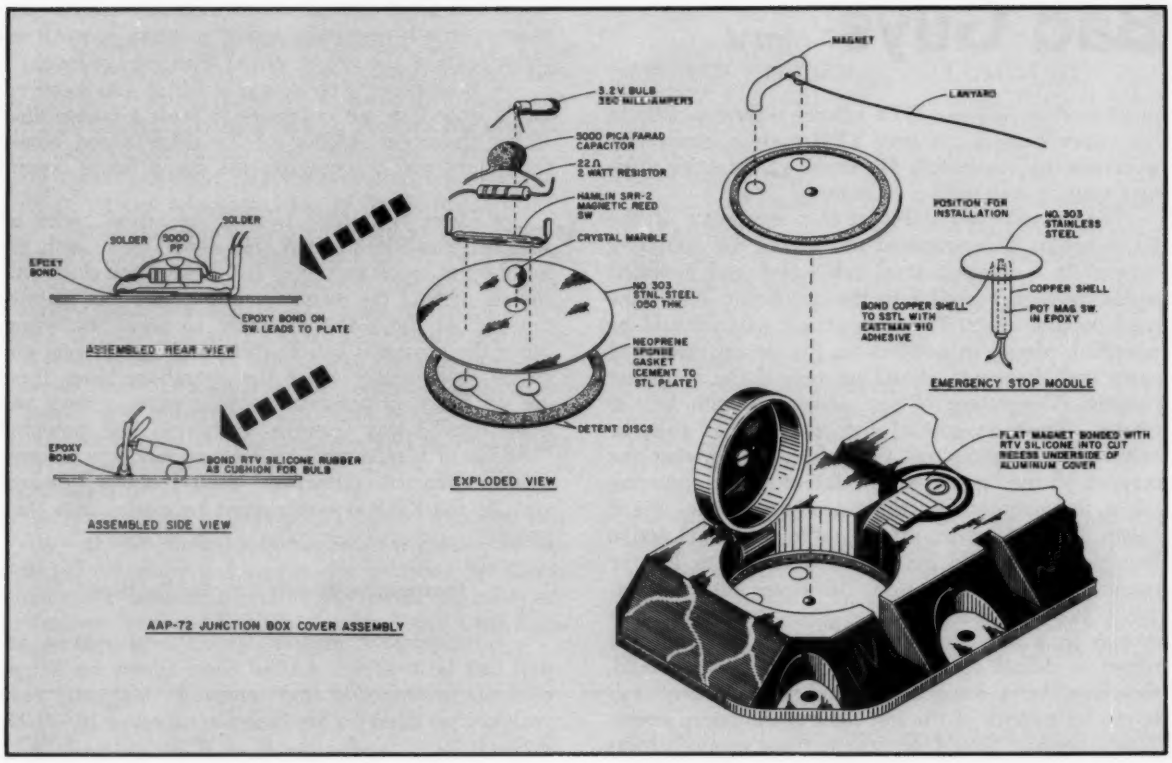
A modified refueling/defueling control system on a JP/4 hydrant outlet at Pease AFB, New Hampshire was activated in December 1972 by the Base Commander. There is nothing unusual in this exercise in itself; however, what is unusual is the fact that the switch device which started that first gallon of fuel through the pipelines was a revolutionary magnet switch device actuator that cost 10 cents. Normally, the POL refuel/defuel switch cords which activate the the hydrants cost $255.58 per set!

The modification to the Pritchard type POL system has been dubbed by its inventor, the author of this article, as the KISS System Modification. The name is derived from one of the applications of value analysis techniques basically known as "Keep It Simple, Stupid."

In order to eliminate the troublesome "POL Bad Guys" (AAP72 Crouse Hinds sockets, plugs, emergency stop switches and switch cables), a substitute switching method was needed. Basic concepts of value analysis dictate that working parts in an assembly should only satisfy the function and, should be as simple as possible. In the case of the existing system, a plug and socket combination rated at 30 amps, 250 volts, is not necessarily functional for an electrical load of 500 milliamperes, 48 volts. Also, inside those expensive, "ruggedized" neoprene vulcanized moldings of the switch cords is a standard 125 volt, 12 amp toggle switch with a most frangible piece of flour-filled phenolic casting used as a socket for the toggle ball. Forces of 20 pounds plus, are required for thumb or finger pressure to turn the pumps "on" or "off." Again, the equipment is not functional for the needs of the operators who must actuate the switches in cold climates and other adverse conditions on an active flight line.

The emergency stop switches have proven to be unreliable (the aluminum body of the switch in contact with the cast steel of the AAP72 cover produces an excellent cathodic/anodic cell in the presence of moisture). The switch bodies have separated from the mechanical button shaft. Some of the emergency stop buttons have been by-passed, necessitating compensating safety procedural operations, to maintain system useability. Functionally, a simple SPST (single pole, single throw) normally open switch, rated at 500 milliamperes, 48 volts, would meet the operational requirements.

Further analysis of the present POL system reveals a questionable "cause and effect" function during the operation. Once the switch cord is turned "on", a delay occurs in experiencing an "effect" since the only action indicator is the subsequent vibration of the hose as the fuel is pumped into the aircraft. The


MAGNET
LANYARD
3.2 V BULB 350 MILLIAMPERS
5000 PICA FARAD CAPACITOR
22Ω 2 WATT RESISTOR
HAMLIN SRR-2 MAGNETIC REED SW
CRYSTAL MARBLE
NO. 303 STNL. STEEL .050 THK.
NEOPRENE SPONGE GASKET (CEMENT TO STL PLATE)
DETENT DISCS
EXPLODED VIEW
POSITION FOR INSTALLATION
NO. 303 STAINLESS STEEL
COPPER SHELL
POT MAG SW. IN EPOXY
BOND COPPER SHELL TO SSTL WITH EASTMAN 910 ADHESIVE
EMERGENCY STOP MODULE
SOLDER
3000 PF
SOLDER
EPOXY BOND
EPOXY BOND ON SW. LEADS TO PLATE
ASSEMBLED REAR VIEW
EPOXY BOND
BOND RTV SILICONE RUBBER AS CUSHION FOR BULB
ASSEMBLED SIDE VIEW
FLAT MAGNET BONDED WITH RTV SILICONE INTO CUT RECESS UNDERSIDE OF ALUMINUM COVER
AAP-72 JUNCTION BOX COVER ASSEMBLY

Modification to POL System—Refuel/Defuel.

need for a functional indicator light is most evident to preclude the "jockeying" of the pumps from "on" to "off" to "on" or even to resorting to the hazardous use of a "short circuit" (a "U" shaped piece of copper wire) inserted into the AAP72 socket instead of the unreliable switch cord.

Using the existing AAP72 cover casting with the sockets and emergency stop buttons removed, three KISS modules of two different types were installed. One of the modules consists of a circular #303 stainless steel plate approximately 0.050 inches thick with a magnetic reed switch epoxy-bonded to the underside. In series with this switch unit is a 22 ohm, 2 watt resistance having a 5000 picafarad capacitor (voltage surge limiter) wired in parallel. This provides approximately 2 volts of power to energize a 3.2 volt rated 350 milliampere bulb used as an indicator light. The 360 degree refractive index "lens" is a standard crystal marble, selected for durability. (How many broken marbles have you ever seen?) The marble is epoxy bonded into a hole in the center of the steel plate. The addition of two ½-inch diameter pieces of galvanized (ferric) steel, epoxy-bonded to the top surface of the stainless steel plate, and a circular neoprene gasket completes the module assembly.

The metal discs provide a marker for placement of the actuating magnet and also provide a detent so the magnet "holds" the "on" position. To stop the pumps, the magnet is removed. Investigation at Pease AFB indicated that the "Slow/Run/Defuel" position was no longer in use since the phasing out of the B-47 aircraft. This factor then allows defuel modules to be exactly similar to the refuel modules. (Green tint applied to refuel indicator bulb and amber tint for defuel can be added just prior to module installation in the empty holes of the AAP72 cover casting.)

The emergency stop module consists of a smaller diameter stainless steel plate with a single magnetic reed switch epoxy-bonded to the underside. A recess must be cut into the inner side of the emergency stop cover and a flat magnet is bonded in to the cover recess. With the cover closed, the magnet rests on the plate and keeps the normally open SPST magnetic switch in the closed position. Emergency stop action then occurs when the cover is lifted separating the magnet from the magnetic switch. The three modules, refuel, defuel and emergency stop, are bedded in a RTV silicone adhesive and sealed and bonded to the AAP72 cover casting in the holes formerly occupied by the 4 and 5 hole sockets and stop button.

Repair is facilitated in this manner since modular replacement techniques are applicable. Repair consists of removal of the old KISS plate module by prying off with a screw driver, then cutting and reconnecting two wires and re-bedding the new replace-

cont'd next page

Bad Guys *cont'd*

ment module into new RTV silicone adhesive. Due to the minor cost of the new KISS system component materials (approximately $1), repair of defective modules may or may not be economical.

To provide a suitable remote operation of the KISS system, it is proposed to connect the operating magnet to a stainless steel cable reel and mounted to the hose cart similar to the grounding lines now used on hose carts. The magnet and cable would be unreeled, placed in position on the detent operating spots and the cover closed on top of the actuating magnet. (Covers are of cast aluminum with bronze hinges, all non-magnetic.) Remote stop can then be achieved by pulling on the cable and moving the magnet off the "spots" with a detent action occurring when the magnet hits the inner lip of the closed cover. The last action, after a refuel or defuel action is completed, would be for the operator to lift the cover of the emergency stop. This drops out the emergency stop relay in the pump house and leaves the system in a non-energized condition. Prior to each refuel or defuel operation the first operation would, therefore, be a reset of emergency stop relay, followed by a check of the test light in the pump house. This procedure would discourage those experimenters with their own "do it yourself" magnets from abusing the POL system.

Model Has Been Built

Not only has one unit been put into operation at Pease AFB, but because of the faith and funding through Headquarters Strategic Air Command (SAC), a "bread board" model has been built using POL relay and transformer components. It has been successfully demonstrated to engineering POL personnel at Headquarters US Air Force and SAC. A patent application has been made to the AF/JACPB, Regional USAF Patent Attorney.

Some of the expected benefits of the KISS System are:

- Cost avoidance of from $450 to $500 per hydrant outlet to repair/replace AAP72 cover assemblies in existing Pritchard systems.
- Elimination of sole source expensive switch cords damaged and nonrepairable at a rate of approximately 80 per year (at Pease AFB).
- Creation of new spare circuits in the POL control system will occur (holding and stop circuits eliminated; 3 wires replaced with 2 wires and 4 wires replaced with 2 wires, that is, a total of 3 new spare wires will be available for use between hydrant outlet and the pump house).
- Existing remote cable system does not meet the National Electric Code for use in hazardous locations. The KISS System has hermetically sealed components in a hermetically sealed junction box. All exterior parts of the system are at zero voltage level.
- Emergency stop action is faster and more reliable since it is not necessary to push a button after lifting the cover. Lifting of the cover alone breaks the circuit and de-energizes the pump house control circuit.
- There is a more reliable operation under all weather conditions. KISS will work even with ice build-up as much as ½ inch to ¾ inch thick since only the strength of the magnetic field determines the distance from the plate necessary to effect switching. Since the system is sealed, dirt, sand, water, fuel and de-ice fluid cannot effect the operation. Since there are no holes, projections, moving parts, screws and other mechanical features visible to the potential "Diddler of Mechanics," inadvertent sabotage is somewhat minimized. (However, even foolproof designs such as the KISS system cannot be made 100% foolproof!)

Inexpensive Repair Can Be Realized

- Inexpensive module system replacement repair can be realized. AAP72 cover plates no longer need to be unbolted and removed. (Magnetic reed switches are rated for life cycles in excess of 10,000,000 cycles.)
- Positive "cause" and "effect" is realized using the indicator light which will only go "on" if the relay coil is energized in the pump house. (Using a 3.2 volt design voltage rated lamp at reduced voltage of 2 volts insures upwards of 30,000 life hours.) Bulb burnout does not preclude the hydrant from continuing to be operable.

Present plans are in process for Headquarters SAC (with the approval of Headquarters US Air Force) to authorize conversion of all the active Pritchard hydrant outlets at Pease AFB (approximately 60 outlets) as a prototype test of the KISS system. After suitable testing time and, if the expected benefits are realized, the KISS system will be used whenever existing controls require repair or replacement. CE

GEORGE BAKER, *formerly an engineer at Pease AFB, New Hampshire, is now assigned to the Director of Construction in the Republic of Vietnam. He earned his bachelor's degree in electrical engineering from the University of New Hampshire, and is a registered Professional Engineer in that state.*

How You Can Help the Journal

Within the past several months, the **Air Force Civil Engineer** Journal Steering Committee has been established within AF/PRE to serve as a focal point for all Journal related activities. Perhaps the most significant aspect of formulation of this Committee is the concerted effort to get the desired type and quality of articles into each issue of the Journal.

What this action means to you, as a member of the Air Force Civil Engineering family, is a noticeable and definite improvement in the type of information published and issues which will contain articles of greater interest to civil engineers world wide. Therefore, when you believe you have an interesting article to be published in the Journal, you have the benefit of a responsible individual at your own command headquarters who can provide you with all the information about getting the article written and published.

Major Command Project Officers who can help you with the general requirements for getting an article published are included in the following list. Get to know him and contact him whenever you have any question about publicity in the **Air Force Civil Engineer** Journal.

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Maj Gen M. R. Reilly, Director of Civil Engineering, Headquarters US Air Force, in an all major command letter recently, wrote: "The **Air Force Civil Engineer** Journal can play a strong role in getting on with our big civil engineering job. With your help and support, we can't miss." Let's hear from you.

The Rated *cont'd*

fied resource without the jeopardy of severe personnel losses in contingency situations.

It is acknowledged in the Personnel Plan that the present day officer force is in a much different configuration from the force envisioned in the TOPLINE model. Getting to that ideal configuration is an evolutionary process and cannot be done overnight—in fact it will take several years. In the meatime, the supplement has proven its value as a resource of qualified civil engineering officers. Because of the low officer manning experienced in calendar year 1972, the fiscal year 1973 supplemental goal was established at 379 (304 pilots and 75 navigators) or approximately 19 percent of the civil engineering officer force. A sufficient number of rated officers are now assigned to civil engineering or identified for assignment during 1973 to achieve this goal and restore officer manning to acceptable levels.

In summary, the rated supplement is not just a management tool but is a key program contained in TOPLINE. The management of the supplement is tailored to the realities of today's officer force, yet remains within the Personnel Plan guidelines and provides objectives toward greater career visibility for, and better management of, all segments of the officer force. CE

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Capt M. A. McAuliffe is presented Meritorious Award by General Reilly.

Edward Lau accepts Meritorious Award (civilian) from General Reilly.

H. W. Christopher is handed Foreman of the Year Award by Gen Reilly.

CMSgt A. J. Hammes receives NCO of the Year Award from Gen Reilly.

Maj J. L. Moore accepts Best Author Award from AFAs Mr John Gray.

5 Honored During National Engineers Week

■ Five members of Air Force Civil Engineering were honored with special citations during the Air Force Civil Engineering Luncheon in tribute to National Engineers Week in February. Sponsored by the Directorate of Civil Enginering, the luncheon was held at the Officers Open Mess, Bolling AFB, Maryland, with over 300 persons in attendance.

Those honored include:

- **Capt Michael A. McAuliffe,** Commander, 7002 Civil Engineering Flight, Headquarters US Air Forces, Europe: Meritorious Achievement Award for Professional Excellence (military);
- **Edward F. C. Lau,** Sanitary Engineer, Headquarters Pacific Air Forces, Hickam AFB, Hawaii: Meritorious Achievement Award for Professional Excellence (civilian);
- **Henry W. Christopher,** 792 Radar Squadron, North Charleston AFS, South Carolina: Foreman of the Year;
- **CMSgt Alfred J. Hammes,** Chief, Operations and Maintenance, 63 Civil Engineering Squadron, Norton AFB, California: Non-Commissioned Officer of the Year; and
- **Maj John L. Moore,** Chief, Facilities Division of Engineering Directorate, Air Force Civil Engineering Center, Tyndall AFB, Florida: Best Author Award.

Maj Gen M. R. Reilly, Director of Civil Engineering, presented the awards to Captain McAuliffe and Mr Lau. The Captain was cited for his engineering and technical competence, leadership, integrity and unswerving tenacity in directing the multitude and variety of major construction accomplished by his unit in support of the USAFE mission. Mr Lau was honored for his significant contribution to the enhancement of professionalism in engineering through demonstrated outstanding performance, emphasis on professionalism to the Command's (PACAF) engineers and technicians, his efforts in establishing training programs for command personnel, his coordination with other federal, state and local agencies and his contributions through community activities.

Mr Christopher was recognized for his outstanding devotion to duty, initiative and application of outstanding leadership. He demonstrated technical knowledge and administrative competence highly sought in those who manage civil engineering activities at radar stations. He accepted his award from General Reilly.

Sergeant Hammes, in accepting his plaque from General Reilly, was honored for his dedication to duty, outstanding professional skill, leadership and effective efforts in directing a multitude of base-wide tasks, which contributed immeasurably to the success of his Command's (ADC) mission.

Major Moore was presented the Best Author Award by John Gray, Assistant Executive Director, Air Force Association (AFA). Presented annually by the Aerospace Education Foundation of the AFA, the award cited Major Moore for his article "The Horse is NOT Dead," which appeared in the August 1972 issue of the **Air Force Civil Engineer** journal. CE

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